1.0 Introduction

The Office of Environment, Safety and Health reviewed safety management of facility disposition efforts at the East Tennessee Technology Park (ETTP) from May to June 1997.

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health (EH) conducted an independent oversight review of selected elements of safety management at the East Tennessee Technology Park (ETTP) from May to June 1997. The purpose of the review was to determine how effectively DOE and contractor line management have implemented an integrated safety management system and environment, safety, and health (ES&H) programs for the ongoing ETTP facility disposition efforts.

Since the ETTP production mission ended in 1987, ETTP has focused on environmental management.

ETTP, formerly known as the Oak Ridge Gaseous Diffusion Plant and later as the Oak Ridge K-25 Site, was established in 1942 as part of the Manhattan Project to produce enriched uranium. Since the site's production mission ended in 1987, ETTP has focused on environmental management activities–the activities related to cleaning up the site–including maintaining facilities pending decisions about their disposition, characterizing and managing hazardous materials and conditions, and preparing for decontamination and decommissioning and the eventual restoration of the site to unrestricted use.

The ETTP mission is evolving toward "reindustrialization," with emphasis on reuse of ETTP facilities.

The recent (1996) change in the name of the site from the K-25 Site to the East Tennessee Technology Park (ETTP) was symbolic of an evolution in the site mission, which now emphasizes reindustrialization and the reuse of site assets, including the site facilities, equipment, utilities, and workforce. This effort involves leasing facilities for commercial use and developing partnerships with commercial industrial organizations to perform ongoing site environmental management activities.

TERMINOLOGY

Facility disposition includes the spectrum of activities (including shutdown, decontamination, decommissioning, and preparation for reuse) related to ETTP facilities that are no longer needed for their original mission or for ongoing activities in support of DOE (e.g., waste management and research and development).

Safety management refers to those systems required to ensure that an acceptable level of protection of the public, workers, and environment is maintained throughout the life of a facility or operation. The term "safety," when used in the context of safety management, specifically includes all aspects of ES&H.

Line management refers to the chain of command that extends from the Secretary of Energy through the Deputy Secretary or Under Secretary to the cognizant secretarial officer, DOE operations office manager, and contractors. Line management consists of DOE and contractor personnel organizationally or contractually responsible for work or job tasks (see Figures 1 and 2).

Integrated safety management system refers to a comprehensive and coordinated program of ES&H expectations and activities. DOE's recently-issued policy, DOE Policy 450.4, Safety Management System, defines six components of an integrated safety management system: 1) the objective, 2) guiding principles, 3) core functions, 4) mechanisms, 5) responsibilities, and 6) implementation. These components provide the framework for the Office of Oversight's evaluation of the ETTP safety management program.

OVERVIEW OF THE EAST TENNESSEE TECHNOLOGY PARK

MISSION: Reindustrialize and reuse site assets (i.e., facilities, equipment, materials, utilities, and trained workforce) through leasing of vacated facilities and incorporation of commercial industrial organizations as partners in the ongoing environmental restoration, decontamination and decommissioning, waste treatment and disposal, and diffusion technology developmental activities.

HISTORY: The site's original mission was production of highly enriched uranium[1] for nuclear weapons using the gaseous diffusion process[2]. After production of highly enriched uranium for military use was discontinued in 1964, the site continued to produce low-enriched uranium for use in the fuel elements of nuclear reactors and had a significant role in research and development activities related to the gas centrifuge method of uranium enrichment and laser isotope separation. Because of the reduced demand for enriched uranium, the gaseous diffusion operations were placed in standby mode in 1985 and the gas centrifuge program was canceled the same year. In 1987, DOE announced its decision to permanently shut down the gaseous diffusion operations and placed the site on a list of facilities slated for decontamination and decommissioning.

LOCATION: ETTP is located on the Oak Ridge Reservation, which is a Federal reservation owned by DOE. The reservation is sited in eastern Tennessee, between the Cumberland and South Appalachian mountain ranges. The site is about 2 miles from Oak Ridge, Tennessee (population 27,000) and 20 miles from Knoxville, Tennessee (population 165,000).

BUDGET AND STAFFING: The budget for 1997 is $221 million for landlord infrastructure, decontamination and decommissioning, surveillance and maintenance, environmental restoration, and waste management. Currently, about 4,500 LMES employees are working at the ETTP or are providing support to the ETTP activities. LMES is in the process of implementing a recently announced 30 percent reduction in force. There are also five companies that currently have agreements to lease ETTP facilities. Collectively, these companies could have about 75 personnel stationed on site.

ONGOING ACTIVITIES AND MAJOR FACILITIES: Most major ETTP facilities, such as the large buildings used to house the thousands of compressors and pumps, and miles of piping (referred to as the cascades), were designed for use in the uranium enrichment mission. These facilities have been shut down for a number of years, although portions are used for miscellaneous functions such as waste storage. Various laboratories and related facilities are being used for ongoing research and development projects in the area of environmental technology or for analytical support (e.g., analyzing samples for monitoring and surveillance). ETTP also has an extensive waste management program; personnel stationed at ETTP support the waste management and cleanup at other OR facilities as well as ETTP. ETTP operates the Toxic Substances Control Act Incinerator, which is licensed to burn both solid and liquid mixed wastes. The commercial companies use the ETTP facilities for a variety of efforts, such as manufacturing waste disposal containers.

[1] Uranium has several isotopes (i.e., atoms with the same number of protons but a different number of neutrons), the most common of which are U-238 and U-235. Natural uranium consists of over 99 percent U-238 and about 0.7 percent U-235. The U-235 isotope is capable of supporting the chain reaction phenomenon that is the basis for nuclear weapons and reactors (i.e., U-235 is fissile), while the U-238 isotope will not support a chain reaction. The fraction of U-235 must be increased from its natural level for use in the nuclear weapons program; increasing the fraction of U-235 is referred to as "enrichment." Similarly, nuclear reactors used in the nuclear navy, most research reactors, and most commercial power reactors use enriched uranium as the reactor fuel; commercial power reactors typically use uranium that has been enriched to between 3 and 6 percent U-235.

[2] Because the isotopes of uranium are chemically identical, they cannot be separated by chemical processes. A number of different types of processes have been developed for enriching uranium, all of which capitalize on the small difference in the atomic weights of the isotopes. These processes require extensive equipment and large amounts of electric power to produce significant quantities of enriched uranium. In the U.S., the vast majority of enriched uranium has been produced using the gaseous diffusion process. The gas centrifuge process and laser isotope separation process are other approaches that have been developed on a laboratory scale but not implemented on a production scale in the U.S.

ETTP line management includes the DOE Office of Environmental Management (EM), the Oak Ridge Operations Office (OR), and Lockheed-Martin Energy Systems (LMES).

The Office of Environmental Management (EM) is the DOE Headquarters office responsible for ETTP. DOE's Oak Ridge Operations Office (OR) is the DOE field element with responsibility for ETTP operations. The current managing and operating contractor is Lockheed-Martin Energy Systems (LMES). Various divisions of Lockheed-Martin, the parent organization of LMES, also manage and operate other major sites in the OR complex (the Y-12 Plant and the Oak Ridge National Laboratory in Oak Ridge, Tennessee) and the two active diffusion plants in the United States–Portsmouth Gaseous Diffusion Plant in Piketon, Ohio, and the Paducah Gaseous Diffusion Plant in Paducah, Kentucky–under contract to the privatized United States Enrichment Corporation. NOTE: When the term "ETTP line management" is used in this report, it refers to the collective line management chain from EM to OR to the contractor.

Figure 1 shows a simplified view of the DOE and contractor organizations that have key roles in managing activities at ETTP. Figure 2 shows a simplified version of the organizational structures of OR and LMES.

The current management and operating contract with LMES expires in April 1998. For the ongoing procurement effort for the next contract, DOE has chosen to implement the integrating contractor concept. In this approach, the new integrating contractor (LMES reports that they are not bidding for the integrating contractor position) will manage the work of multiple subcontractors. The integrating contractor and its subcontractors will be responsible for performing ongoing site activities, such as waste management, most decontamination and decommissioning efforts, ES&H support services (e.g., radiological control), utilities, and plant security. Each defined area of work will be performed according to a separate contract, so that OR and the new integrating contractor may be managing the efforts of a large number of different subcontractors.

Scope

The review of ETTP focused on the effectiveness of EM, OR, LMES, and selected LMES subcontractors in implementing safety management principles for the facility disposition effort. The facility disposition effort encompasses the activities related to surplus facilities from the point at which a determination is made that they are no longer needed by DOE until they are either demolished or cleaned sufficiently that they can be released for use. This effort encompasses:

- Surveillance and maintenance–Monitoring facility conditions and performing needed upkeep to ensure that remaining hazardous materials are controlled until they can be removed and that the building is maintained in a safe condition.

- Deactivation–The removal or stabilization of hazardous conditions and materials to reduce potential hazards and reduce surveillance and maintenance costs.

- Decontamination and decommissioning activities–Removal of hazardous materials and contamination to below specified levels, removal of equipment and interior structures, and, in some cases, demolition of structures.

The facility disposition effort is a prerequisite to the eventual goal of restoring the site for unrestricted use–usually referred to as environmental restoration–which may also involve cleaning up the site soil and water so that residual levels of contamination are below specified limits.

Facilities at various stages of disposition were reviewed.

The EH Office of Oversight team examined the application of safety management at shutdown facilities, decontamination and decommissioning projects, and leased facilities. Within each of these three categories, Oversight selected specific facilities to

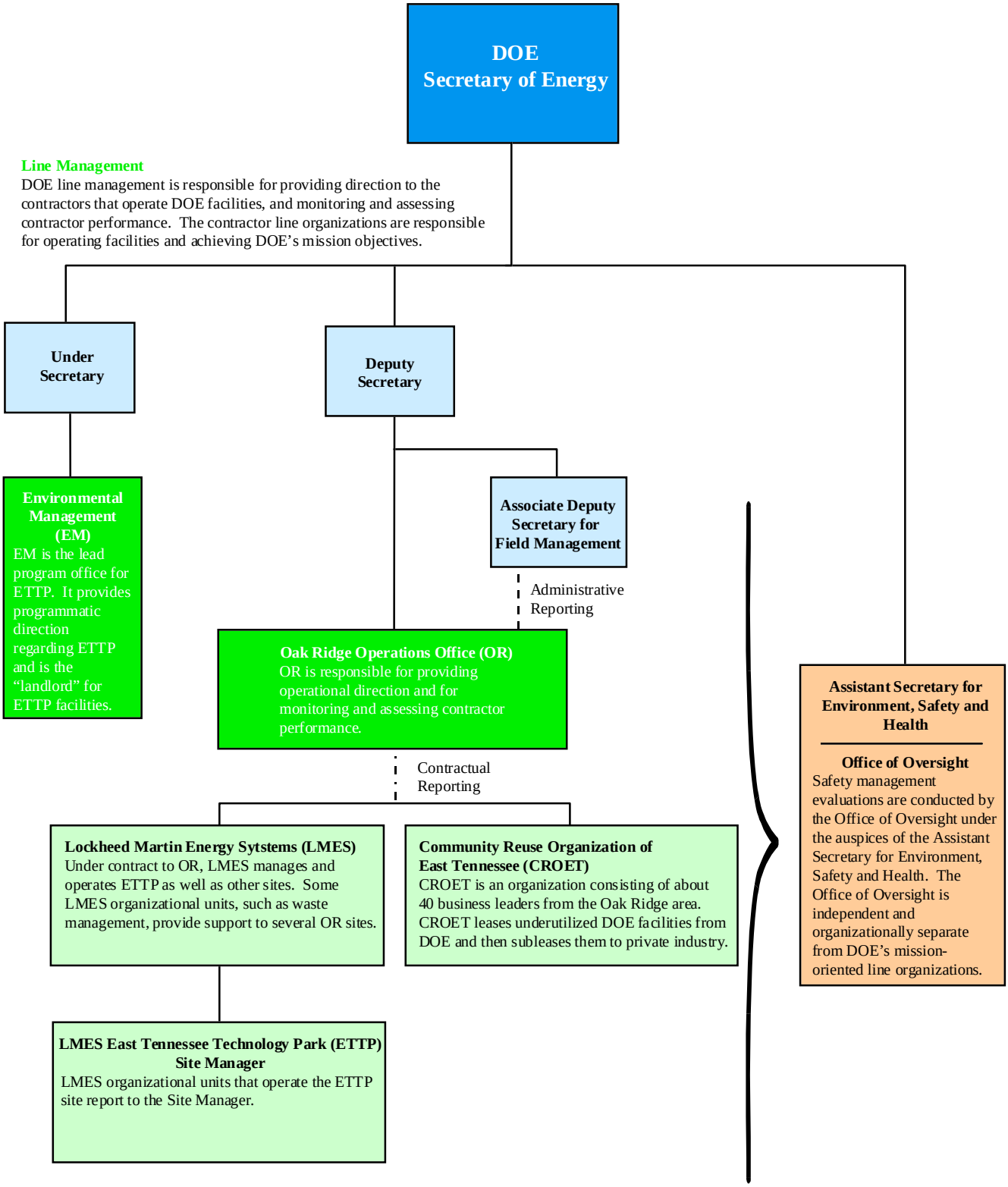

Figure 1. Organizations with Responsibilities at East Tennessee Technology Park

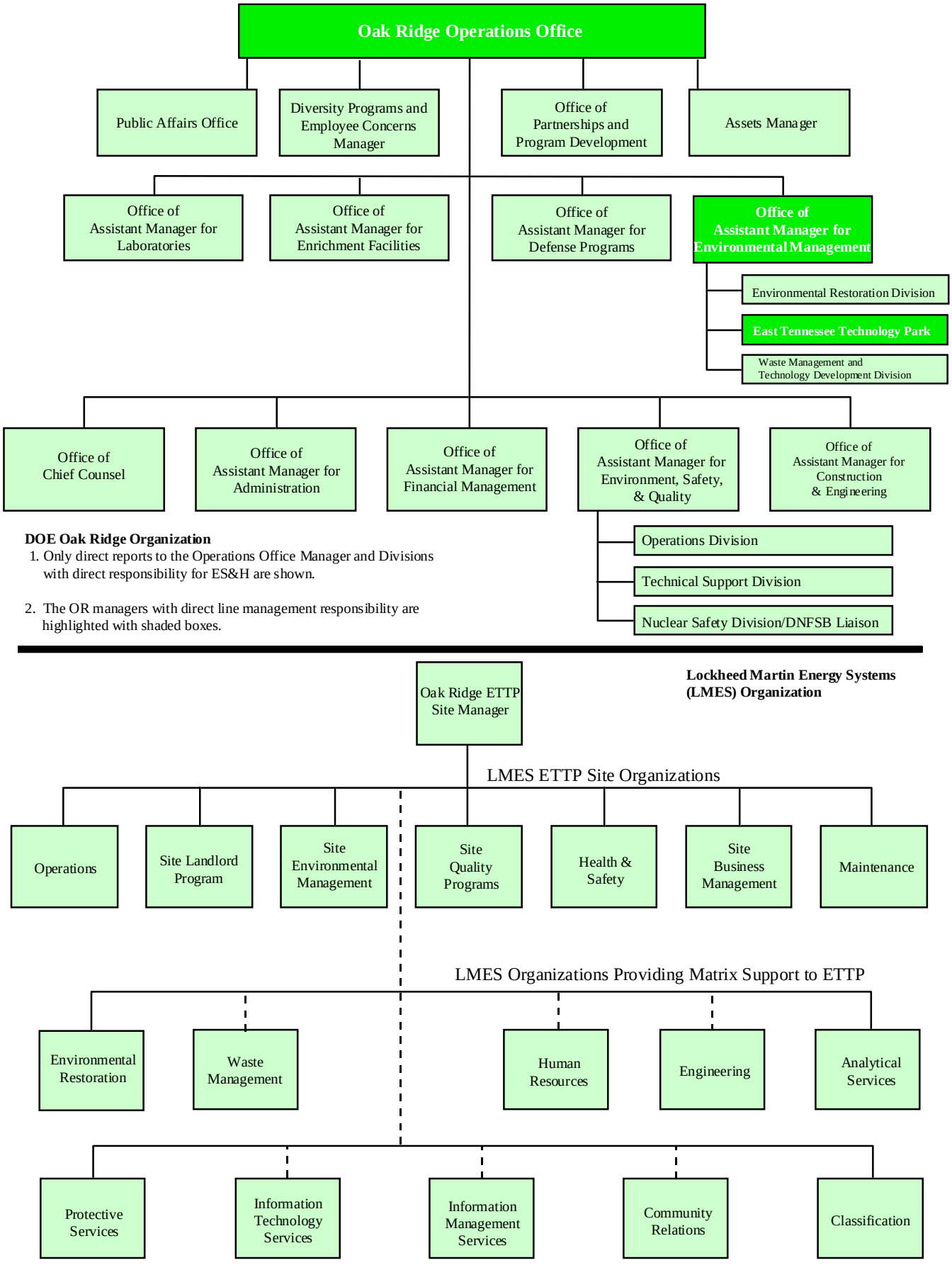

Figure 2. DOE Oak Ridge and East Tennessee Technology Park Organizations

review in depth. At these facilities, the Oversight team examined selected ES&H topics, including radiological protection, industrial safety/hygiene, construction safety, and maintenance. The characteristics and potential hazards for the facilities selected are shown in Table 1.

Corrective action and lessons learned programs were also reviewed.

The Oversight team also reviewed the OR and LMES corrective action and lessons learned programs. The emphasis was on recent OR and LMES efforts to correct systemic weaknesses in implementing corrective actions and lessons learned programs that were evident in previous assessments and accident investigations at ETTP.

TABLE 1. POTENTIAL HAZARDS AT FACILITIES REVIEWED

Facility	Characteristics and Activities	Hazardous Materials and Conditions
Shutdown Facilities		
K-725, Machine Shop	Shutdown and abandoned in place – access to the building is prohibited. Upon initial shutdown and again in the 1970s, ETTP attempted to decontaminate the building and seal ventilation ducts containing beryllium; these attempts were unsuccessful.	Beryllium contamination and mercury in floor drains. Radioactive contamination. Degraded building structures, including a leaking roof, crumbling walls, and missing windows. Conditions (beryllium contamination and degraded structures) are such that access to the building is prohibited in essentially all circumstances (including surveillance, maintenance, and assessments).
K-1131, Feed and Tails Building	Approximately 50,000 square feet of floor space. Shutdown and abandoned in place – only normal activity is the annual surveillance and occasional entries.	Radioactive contamination. Residual fluorides and lube oil, asbestos, oils, volatile organic compounds, selenium, nickel, and cadmium in electrical components. Degrading building structures. Leaking roof accelerating building degradation and exposing materials to rain and temperature variations. UF_6 cylinders in areas where they are exposed to environmental conditions.
K-1420, Decontamination Building	Approximately 80,000 square feet of floor space. In shutdown status – only activities are limited surveillance and maintenance. Request for proposal issued for cleanup and deactivation.	Special nuclear material; radioactive, hazardous, and mixed wastes. Radioactive contamination. Chemical deposits in equipment (e.g., nickel sulfate). Potential environmental releases to adjacent stream.
Decontamination and Decommissioning Projects		
K-29, Diffusion Cascade	One of the five "cascade" buildings at ETTP. Two story building with over 580,000 square feet of floor space. Encompasses hundreds of compressors and pumps and miles of piping, and extensive support equipment. Shutdown since the mid-1980s and preparing to undergo decontamination and decommissioning. Used for low-level radioactive and hazardous waste storage.	Potential for nuclear criticality. Radioactive contamination. Storage of low-level radioactive waste in liquid, solid, and sludge forms. Uranium deposits in process piping and equipment. Hazardous chemicals and materials, including hydrogen fluoride, asbestos insulation, oils, and polychlorinated biphenyls (PCBs). High voltage electrical equipment. Hazardous demolition and disassembly activities (cutting, falls, welding).
Leased Facilities		
K-1420, Maintenance Building	Formerly used for maintenance activities. Shutdown with limited surveillance and maintenance. Approximately 400,000 square feet of floor space and large amounts of machine tools and equipment. Currently used by ETTP and commercial companies for various activities. Various materials stored in basement.	Radioactive contamination. Loose and degrading asbestos. Water leaks potentially transporting radioactive contamination and asbestos under barriers. Ventilation air flow over contaminated canals and groundwater. Hazardous chemicals, including pesticides, and herbicide storage.